PUTTING RESEARCH TO WORK BRIEF

Measuring the Benefits of Intelligent Transportation Systems

Since the early 1970s, the Wisconsin Department of Transportation has taken advantage of computer and information technologies, known as Intelligent Transportation Systems, to help reduce highway congestion and improve safety. WisDOT established a formal ITS program in 1993 and in 2000 began determining ITS planning and program resources for a 10-year timeframe.

What's the Problem?

As the department moved in 2002 toward development of specific ITS design criteria, more detailed benefit/cost analysis tools were needed to compare one type of solution to another. A 2000 WisDOT research project (No. 0092-45-20) identified several potential tools. This study takes the next step of applying these and other tools to several WisDOT ITS projects as case studies, and recommends a deployment approach for making ITS a mainstream part of the transportation planning process.

Research Objectives and Methodology

This project's primary goals were to develop and test ITS benefits evaluation methods to address a wide range of needs throughout Wisconsin. These evaluation methods aim to help WisDOT identify the optimal level of investment in ITS. Researchers' tasks included:

• Surveying approximately 35 stakeholders to establish project criteria. A questionnaire was prepared and sent to WisDOT central office and district personnel, and to a sample of municipal officials and private stakeholders.

• Performing a literature search to identify state-of-the-art methods of ITS benefits analysis. Researchers compiled a review of recent nationwide research efforts to develop impact evaluation methodologies and field operational evaluation methodologies (the latter often provide guidance in the design of the former).

• Identifying benefit/cost methodologies appropriate for use in Wisconsin, and recommending a set of tools for testing.

• Crafting a deployment philosophy for development of ITS alternatives. The philosophy was built on parameters already identified by WisDOT, and encompasses a range of ITS solutions that can be applied in different settings across the state.

• Selecting six candidate case studies, covering a range of ITS applications and geographic settings, to test the benefits analysis tools. The projects include a freeway management system on US 45 in Milwaukee County; a ramp metering project on the Madison Beltline; an overheight detection system on US 41 in Appleton; WisDOT commercial vehicle operations projects (including the I-90/I-94 "smart scales" project and an automated permitting system); an automated vehicle location system for transit vehicles in Milwaukee County; and construction-related traveler information systems for the East Washington Avenue project in Madison.

Results

The literature search identified several evaluation methodologies that could be tailored to WisDOT's needs. Effective analysis tools must be flexible and address a range of benefits; the stakeholder survey and project workshops indicate that while benefits related to travel time and safety are generally given the most weight in evaluating ITS projects, at certain times benefits related to environmental impacts, commercial vehicle operation or transit may take priority.

The methodologies identified by the researchers included:

• Network-based tools that can use regional travel demand models or other network-based data to

Investigator

"This study allows WisDOT to take a firsthand look at how some of the methodologies and variations could perform for Wisconsin ITS projects."

–Daniel Krechmer
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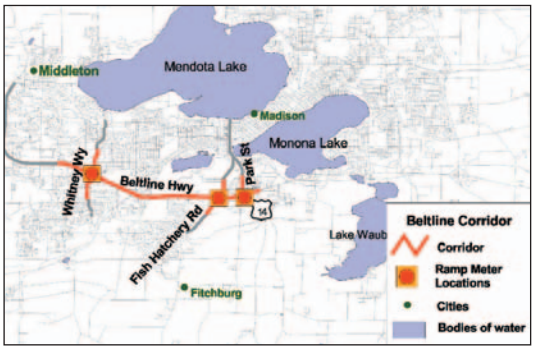

The ITS Deployment Analysis System was used to estimate the benefits of the 2001 Madison Beltline Ramp Metering Project (left, Fig. 3.4, page 3-8 of final report). IDAS estimated annual savings at $3.38 million (1995 dollars), primarily from projected reductions in travel times and accidents. At right, cars approach a ramp meter at a Beltline entrance ramp.

evaluate benefits at the regional or corridor level. The ITS Deployment Analysis System, or IDAS, was identified as the most advanced tool for this purpose. Its advantages include limited data requirements and good integration with the regional transportation modeling process.

• Customizable spreadsheet-based tools for use in stand-alone or limited ITS deployments, or for use in areas where travel demand models are not available.

• Simulation-based network design models, which are useful in refining the design of ITS systems. Their strength lies in developing detailed impact evaluations of ITS applications on a corridor level and on an individual traveler level.

Spreadsheet-based tools and IDAS will be tested within the case studies, many of which are ongoing over several years. The case studies indicate that ITS benefits evaluation tools can be effectively deployed by WisDOT and can also be transferred to regional and local agencies.

Implementation and Benefits

The methodologies evaluated in this study will result in more targeted, cost-effective deployment of ITS in Wisconsin. The ability to perform cost/benefit analysis will also allow ITS projects to compete with more traditional highway projects for funding. In the past, WisDOT has relied heavily on dedicated federal ITS funds to finance the state's ITS program, but with upcoming reauthorization of the federal transportation program, these funds may not be as readily available in the future.

Further Research

As ITS deployment expands in Wisconsin, control and management strategies should be developed to address the needs of different populations. For example, in the Milwaukee region, coordination with the city's MONITOR freeway management system and the Gary-Chicago-Milwaukee corridor is a critical issue. In less urban areas, WisDOT should determine whether satellite or smaller traffic management centers are needed, or whether ITS operations can be incorporated into regional offices or county or municipal traffic management centers.

Project Manager

"Having a methodology like IDAS in place will help WisDOT make a strong case to legislators for ITS funding."

–Phil DeCabooter
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